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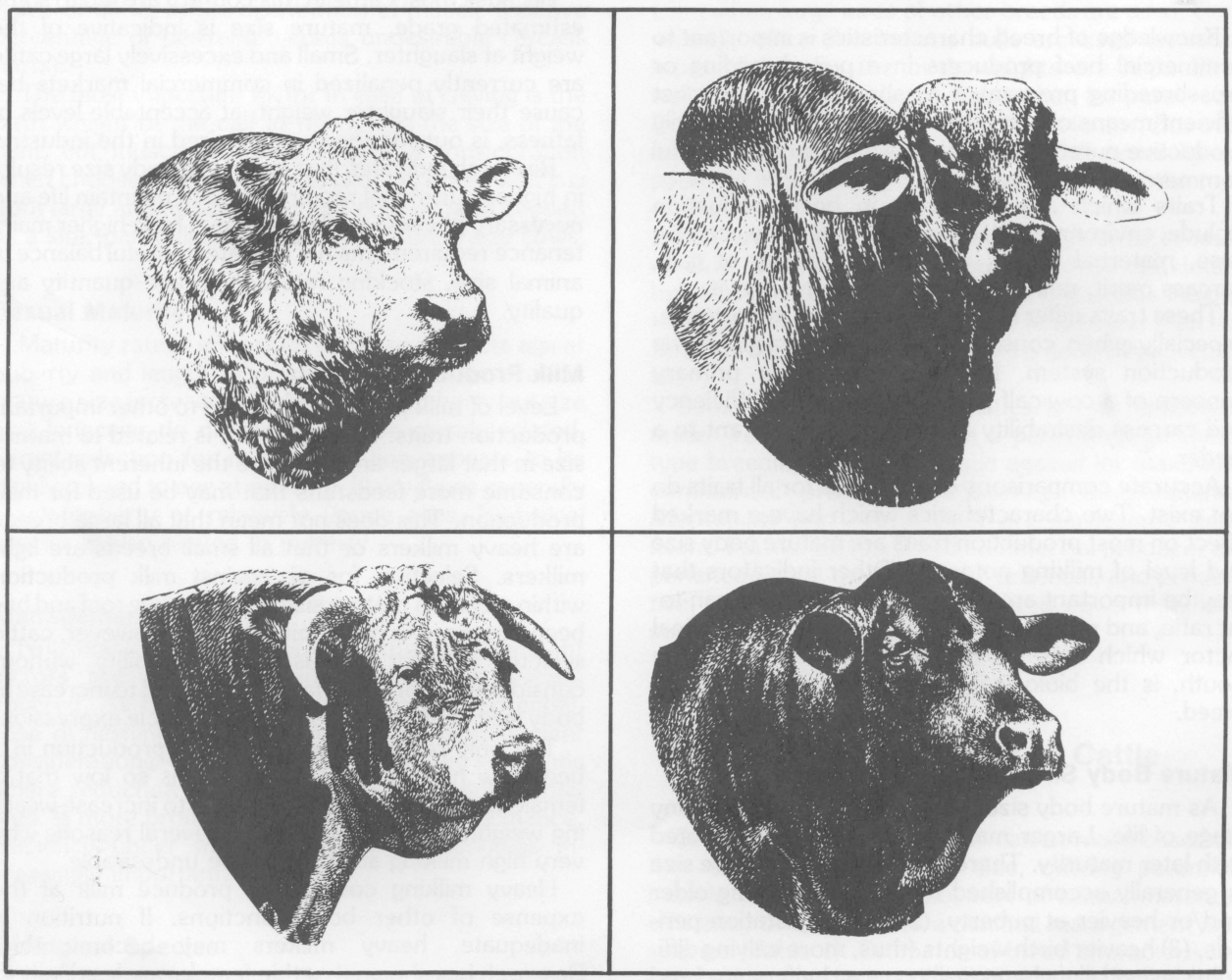
Choosing Breeds for Commercial Beef Production



Texas Agricultural Extension Service • Zerle L. Carpenter, Director • The Texas A&M University System • College Station, Texas

CHOOSING BREEDS FOR COMMERCIAL BEEF PRODUCTION

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Currently there are more than 50 breeds of cattle found in Texas. All of these breeds, including dairy cattle, are used to produce beef. An exact count is difficult because other breeds continue to be imported and new breeds are continuously created by crossing existing breeds and then inter-mating the crosses.

Production Characteristics

Knowledge of breed characteristics is important to commercial beef producers in a pure breeding or crossbreeding program. Crossbreeding is the most efficient means of commercial production, but highly productive purebreds are the backbone of successful commercial crossbreeding.

Traits which are important in beef production include environmental adaptability, fertility, calving ease, maternal ability, rate and efficiency of gain, carcass merit, market acceptance and longevity.

These traits differ in relative economic importance, especially when considering different phases of the production system. Reproduction is the primary concern of a cow-calf producer while feed efficiency and carcass desirability are the most important to a feeder.

Accurate comparisons of all breeds for all traits do not exist. Two characteristics which have a marked effect on most production traits are mature body size and level of milking potential. Other indicators that may be important are muscle expression, or lean-to-fat ratio, and rate of maturity or age of puberty. A final factor which may be important, especially in the South, is the biological species represented in the breed.

Mature Body Size

As mature body size increases so does size at any stage of life. Larger mature size is often associated with later maturity. Therefore, increased mature size is generally accomplished by (1) heifers being older and/or heavier at puberty, (2) longer gestation periods, (3) heavier birth weights (thus, more calving difficulty, especially when small cows or heifers are bred to sires of large mature size), (4) faster rate of gain and (5) heavier weaning weights.

In the feedlot, if cattle are fed to the same age or for the same length of time, large mature size cattle have faster, more efficient gains, lower marbling, less fat and improved cutability. If feeding is to similar carcass grades, these differences among cattle of different mature sizes are greatly reduced or eliminated.

Because most cattle in this country are fed to some estimated grade, mature size is indicative of the weight at slaughter. Small and excessively large cattle are currently penalized in commercial markets because their slaughter weight, at acceptable levels of fatness, is outside the range desired in the industry.

Research indicates that increased body size results in higher nutritional requirements to maintain life and necessary physiological functions. These higher maintenance requirements necessitate a careful balance of animal size, stocking rate and forage quantity and quality.

Milk Production

Level of milk potential is related to other important production traits. Milking ability is related to mature size in that larger animals have the inherent ability to consume more feedstuffs that may be used for milk production. This does not mean that all large breeds are heavy milkers or that all small breeds are light milkers. Selection for or against milk production within a certain mature size is an effective tool and has been practiced in developing breeds. However, cattle selected only for increased milking ability, without consideration for other factors, will tend to increase in body size with some reduction in muscle expression.

The only reason to increase milk production in a beef cow herd, unless production is so low that a female cannot raise her own calf, is to increase weaning weights of calves. There are several reasons why very high milking ability could be undesirable.

Heavy milking cows often produce milk at the expense of other body functions. If nutrition is inadequate, heavy milkers may become thin. Research has shown that thin females are less likely to come into heat and settle than those in good flesh. There is also evidence that heavy milkers may be slow to cycle even when heavily fed which impairs the rebreeding interval and general reproductive efficiency.

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Heavily fertilized, well managed, irrigated pastures offer a distinctly different set of opportunities and problems than an extensive range operation where precipitation is sparse and unpredictable. The optimum level of milking potential in a beef herd is closely related to the quantity and quality of forage and other feedstuffs.

Muscle Expression

Fat is the most important factor affecting the percentage of red-meat yield, but degree of muscling is also important. If the importance of the percentage of lean in slaughter cattle increases, the importance of a breed's muscling must also increase.

Muscularity also appears to be involved in reproductive efficiency. Very heavily-muscled females tend to be low in fertility and experience increased calving difficulty. Heavy-muscled sires are more likely to cause calving difficulties. Most breeds that are ranked as above average in muscle expression are above-average in size too. This indicates that there is less difference among breeds in muscle-to-bone ratio than in body size and there is little difference between types of cattle in the distribution of muscle (relative percentage of desirable versus undesirable carcass parts).

The most important factor in ease of calving is the birth weight of the calf in relation to the size of the dam, but muscling should also be a consideration when choosing breeds for crossing. A breed which is both large and muscular should be used with caution as a sire, particularly on small to medium size cows.

Sexual Maturity

Maturity rate is important because it affects age at puberty and length of productive life. In general, as mature size increases, so does age at puberty but size and longevity do not appear to be closely related. Direct selection for milk production appears to be highly related to age at puberty. Dairy types generally reach puberty at relatively young ages. Biological species is also related to puberty.

Management Efficiency

Nutritional requirements and other management factors are closely related to functions already covered. As body size increases, milking potential, ease of fleshing, nutrition and general management considerations become more critical. In situations where reduction of costs, particularly supplemental feed, is more profitable than increased performance, efficiency under marginal conditions becomes increasingly important.

Biological Species

British and Continental European breeds of cattle are derived from *Bos taurus* ancestry while *Bos indicus* or Zebu-type cattle are the humped animals that originated in India. The latter types were used to develop the American Brahman and other Zebu breeds. Several characteristics unique to *Bos indicus* are not explained by mature size or milk production. These factors are especially important in the South where Zebu-types are common in commercial production.

In comparison to *Bos taurus* breeds, *Bos indicus* are exceptionally adapted to tropical and sub-tropical environments which include the stresses of heat, humidity, parasites and low-digestibility forages. *Bos indicus* are not particularly adapted to extremely cold conditions.

The general vigor, especially early in life, and reproductive efficiency of purebred *Bos indicus* may be poor, but this is not the case of hybrids between *Bos indicus* and *Bos taurus*. In fact, true hybrid *Bos indicus-Bos taurus* are generally vigorous and fertile, particularly when compared to *Bos taurus* types under tropical or sub-tropical conditions. *Bos indicus* are later maturing than *Bos taurus* but their longevity or length of productive life is greater.

The birth weights of purebred *Bos indicus* are unusually low. This seems to be primarily a maternal characteristic because the birth weights of calves from *Bos indicus* females are lighter than expected, even when large sires of other breeds are used. Conversely, when *Bos indicus* bulls are used on other types of females the birth weights are high. Birth weights of crossbreds are higher than for purebreds. Because of this maternal birth weight factor, *Bos indicus* females (purebred and crossbred) generally experience little calving difficulty regardless of the type of sire.

Due to rather diverse genetic backgrounds, crosses of *Bos indicus* and *Bos taurus* exhibit maximum hybrid vigor for most production traits. *Bos indicus* tend to be lower in marbling and tenderness than the *Bos taurus*, but the eating quality is generally acceptable.

Some of these characteristics are so important under Texas conditions that a percentage of Zebu-type breeding is hard to argue against for maximum commercial production efficiency. Environmental adaptability and hybrid vigor are particularly significant. Formal research and commercial producer experience reveal that the most practical, and productive, application is with cross-bred cows that have some *Bos indicus* genetics.

Functional Groups of Cattle

Several groupings of breeds can be made based on the relationships between size, milking potential, muscle or lean-to-fat ratio, rate of sexual maturity, efficiency under extensive-minimal management and species (Table 1). Estimates of breed characteristics from references were utilized in making these groupings. This is an attempt to evaluate breed averages while recognizing the significant variation within breeds. Breeds listed are recorded with registration associations in the United States.

Table 1. Functional groups of cattle[1].

Group 1	Group 2	Group 3 Cont.	Group 6
Angus*	Amerifax	Charbray[3]	Brown Swiss
Beefalo	Milking Shorthorn	Gelbray	Holstein*
Belted Galloway	Normande	Pinzbrah[3]	
Devon	Pinzgauer*	Red Brangus	Group 7
Dexter	Red Poll*	Santa Gertrudis	Brahman
Galloway	Salers*	Senepol	Guzerat
Hereford*	South Devon	Simbrah[3]	Gyr
Murray Grey	Tarentaise		Indu-Brazil
Polled Hereford*	Welsh Black	Group 4	Nellore
Red Angus*		Beef Friesian	Sahiwal
Scotch Highland	Group 3	Braunvieh	Zebu[2]
Shorthorn*	Barzona	Char-Swiss	
Sussex	Beefmaster	Gelbvieh*	Group 8
Texas Longhorn	Braford	Maine-Anjou*	Blonde D'Aquitaine
White Park	Brahmanstein	Simmental*	Charolais*
	Brahmaine[3]		Chianina
	Brahmousin[3]	Group 5	Limousin*
	Bralers	Ayrshire	Marchigiana (Markey)
	Brangus	Guernsey	Piedmont
		Jersey	Romagnola

[1]See text for explanation of groups.
[2]Recorded in International Zebu Breeders Association.
[3]Recorded in registry of non-Brahman parent.
*Breed used in forming a Zebu-crossbred breed (Group 3).

Group 1. These breeds are small to medium in size (only the Dexter is classed very small), very low to moderate in milking, light to moderate muscled, early to medium maturing, and good to very good in efficiency under extensive conditions. The group is made up mostly of the traditional British beef breeds. They are not extreme in any characteristic and may be considered middle-of-the-road, "benchmark" breeds.

Group 2. Included here are breeds medium to large in size, moderate to high milking, light to heavy (mostly moderate) muscled, early to medium maturing, and low to good in efficiency under minimal management. These are basically the smaller to moderate dual-purpose breeds of British or Continental European (Exotic) backgrounds. Their logical use is similar to Group 1, but Group 2 breeds are generally somewhat larger and higher producing making them more likely to react adversely to nutritional stress.

Group 3. These crossbred-based breeds have been synthesized primarily in the United States in Texas and surrounding states. These breeds range from medium to very large in size, moderate to high in milking potential, light to heavy (mostly moderate) in muscling, medium to late maturing, and good or very good in efficiency under extensive (not extremely cold) climatic conditions. Most of these breeds contain from three-eighths to one-half American Brahman, the remainder generally consisting of one other breed, which is often evident in the name of the breed. The Senepol contains no *Bos indicus*, but instead contains N'dama, a tropically adapted non-Zebu cattle from West Africa.

These breeds represent a variety of uses with the largest being an effective terminal sire. Maternal use is indicated in terminal crosses, rotations or commercial straightbreeding. This group has become increasingly popular in the South and Southwest. With more uses in this region, new breed combinations continue to be developed.

Group 4. These "super producers" are very large to extremely large in size, high to very high milkers, with heavy to very heavy muscle expression. These breeds tend to be early to medium maturing in spite of their size, presumably because of their selection for dairy use. Included are the larger, Exotic, dual-purpose breeds and a synthesized breed. These breeds are big and muscular enough to be chosen for terminal sires. Their milk potential directs them to the maternal side of a terminal cross or, less logically, rotation. Nutritional requirements, however, are potentially as high as for any type of cattle, a factor of paramount importance in the maternal application of these breeds. Because of this, the group is ranked low to moderate in efficiency under minimal management.

Group 5. These cattle are small to medium in size, very high milking, very light to light muscled, and very early to early maturing. They are the traditional, smaller dairy breeds. Low growth potential and light muscling restricts the logical use of this class to specialized maternal sides of terminal crosses. Their milking potential warrants caution in their use when nutritional conditions are marginal because their efficiency under extensive conditions is only low to moderate.

Group 6. These are the "super milkers". These breeds are large to very large, very high to extremely high milking, light to moderate muscled, and early maturing. Included are the larger, heaviest-milking traditional dairy breeds. Their logical use is on the maternal side of a terminal cross where relatively large

size and heavy milking can be exploited. These traits can be a disadvantage because the efficiency of this group under extensive conditions is very low to low, poorest of any group.

Group 7. This group, the pure *Bos indicus* or Zebu breeds, is based solely on biological species. These breeds range from small to very large in size, though most are medium or larger. They range from low to high milking, light to moderate muscling, and are the latest maturing of all cattle. The Brahman and the term Zebu (as used here) are intended to mean the American-created *Bos indicus* cattle. The remaining breeds or strains in this grouping have all contributed to the development of American Brahman-Zebu cattle. They are currently being re-introduced to this country in a relatively pure state, primarily from Brazil and they are being recorded in either the American Brahman or International Zebu registry associations.

The primary use of pure Brahman-Zebu cattle is to produce F_1 crossbred females, which have generally been shown to be the outstanding cows for commercial production in the South and Southwest. Their efficiency under extensive conditions ranges from moderate to very good, unless extreme cold is encountered in which case efficiency of this group may decline drastically.

Group 8. These "super sires" of the cattle kingdom, along with Group 4, are large to extremely large, but have low to moderate milking abilities. They are medium to late maturing and heavy to extremely heavy muscled. All are native to either France or Italy. Their most logical commercial use is as a terminal sire and, perhaps in spite of popular belief, they also have some maternal application where a crossbred cow of large size but relatively low milking is desired. Their efficiency under minimal management ranges from moderate to good.

The physiological characteristics of these groups are shown in Figures 1 through 5. Their application in commercial breeding systems is summarized in Table 2.

Market Acceptance

Market acceptance is important in choosing breeds because the production of additional weight is pointless if poor market desirability, in the form of price discounts, results in reduced total income. The price received is not always directly related to production characteristics and some price discounts may be unwarranted because the beef industry is traditional and highly conservative. Short-term market preferences may change rapidly, but breeding programs cannot be altered so quickly.

At one time crossbreds of any kind were discounted when compared to straight-breds, but this situation has almost completely reversed. Currently the highest price per pound is received for desirable crossbreds common in a particular market area. Desirable crosses may contain traditional beef, Exotic, and/or Zebu-type genetics, with no particular type being predominant. Graphic evidence of dairy breeding is often penalized. Extremes of any kind, including most straight-breds, are often discounted unless special markets are found. Regional preferences can be highly variable. Consistent, adequate numbers of any cattle type must be available if prices are to be generally favorable.

Summary

The choice of breeds today is almost overwhelming with more than 50 breeds available. Choice is related to the type of mating system employed. The basic question in genetic management of commercial beef herds should be, "Which breeds and systems will produce the highest net income?". Knowledge of breed characteristics is important for the producer to make the right decisions.

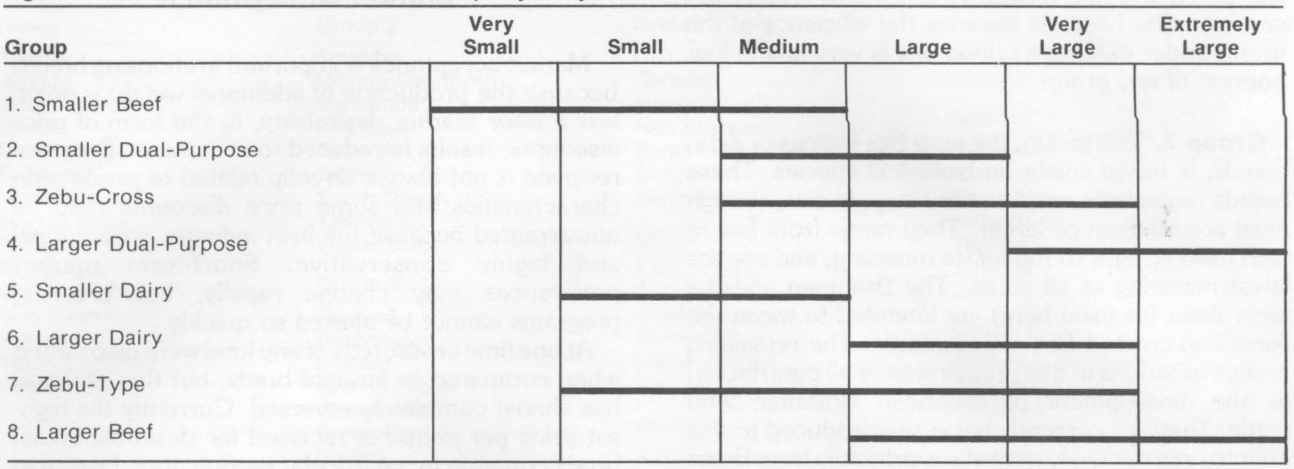
For a discussion of crossbreeding plans, see *Crossbreeding Systems for Beef Production*, L-2153, Texas Agricultural Extension Service, Texas A&M University.

Table 2. Application of functional groups of cattle for commercial beef production.

Group	Straight-breeding	Maternal Use[3]			Terminal Sire	1st-calf Heifer
		Lt. Milk	Mod. Milk	Hvy. Milk		
1. Smaller Beef[1]	X	X[4]				X[7]
2. Smaller Dual-Purpose			X			X[7]
3. Zebu-Cross	X		X		X[6]	
4. Larger Dual-Purpose				X[5]	X	
5. Smaller Dairy				X[4]		X
6. Larger Dairy				X[5]		
7. Zebu-Type			X			
8. Larger Beef[2]		X[5]			X	

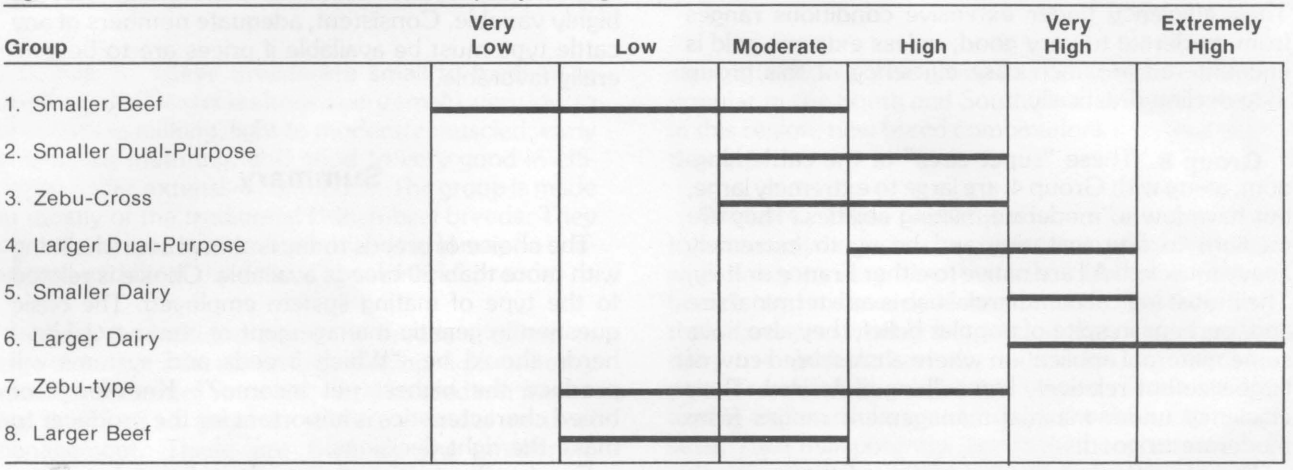
[1]Mostly traditional British beef breeds.
[2]Continental European breeds developed only for beef production.
[3]On cow side of terminal crosses. Also indicates possible use in rotation crosses. The most generally applicable types for rotation crosses are Groups 1, 2 and 3.
[4]Where smaller body size is desired.
[5]Where larger body size is desired.
[6]Where Zebu background is needed in sires for environmental adaptability.
[7]Smaller breeds within this group.

Figure 1. Characterization of Functional Groups by Body Size.



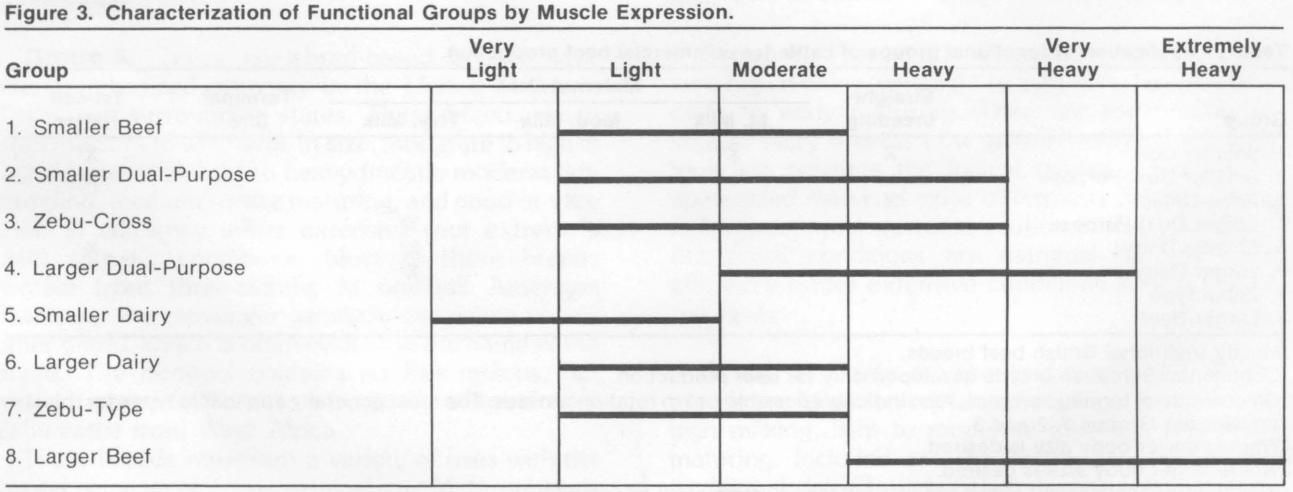
NOTE: See text for explanation. Ranges within groups are breed averages. Individual animals may exceed these ranges.

Figure 2. Characterization of Functional Groups by Milking Potential.



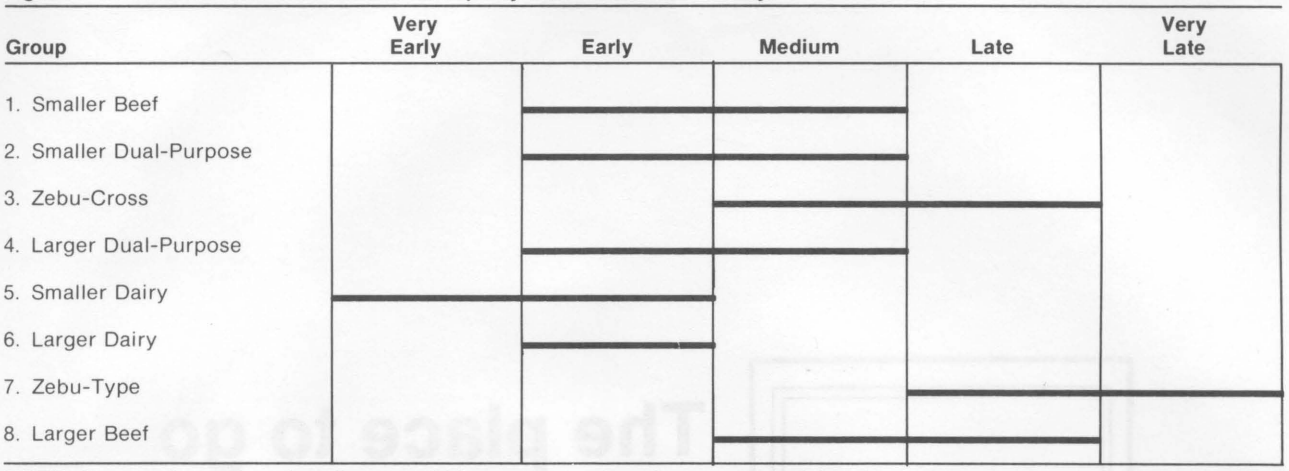
NOTE: See text for explanation. Ranges within groups are breed averages. Individual animals may exceed these ranges.

Figure 3. Characterization of Functional Groups by Muscle Expression.



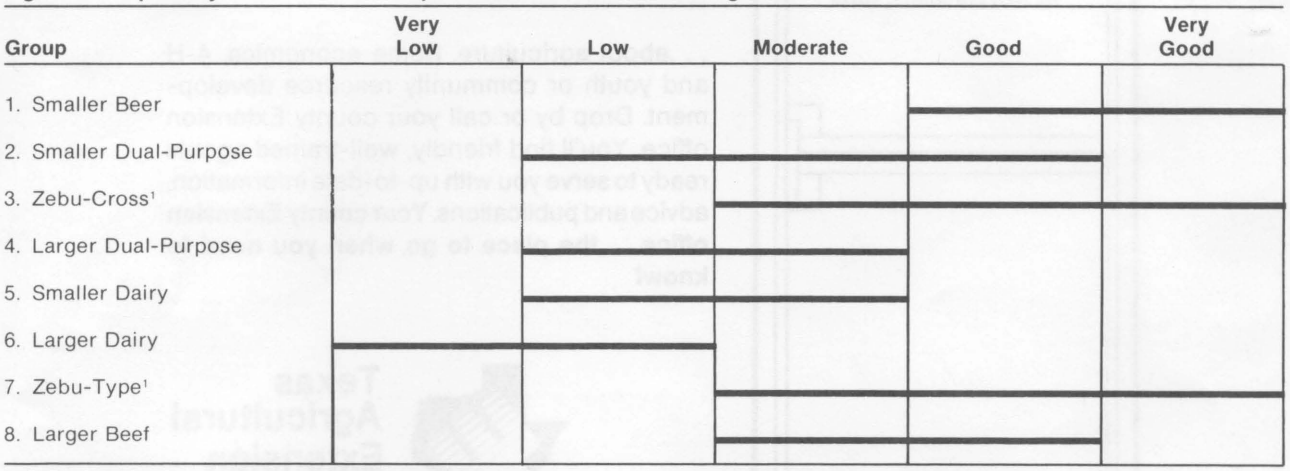
NOTE: See text for explanation. Ranges within groups are breed averages. Individual animals may exceed these ranges.

Figure 4. Characterization of Functional Groups by Rate of Sexual Maturity.



NOTE: See text for explanation. Ranges within groups are breed averages. Individual animals may exceed these ranges.

Figure 5. Adaptability of Functional Groups to Extensive-Minimal Management.



NOTE: See text for explanation. Ranges within groups are breed averages. Individual animals may exceed these ranges.
[1]Zebu-Cross and Zebu reduced in extremely cold conditions.

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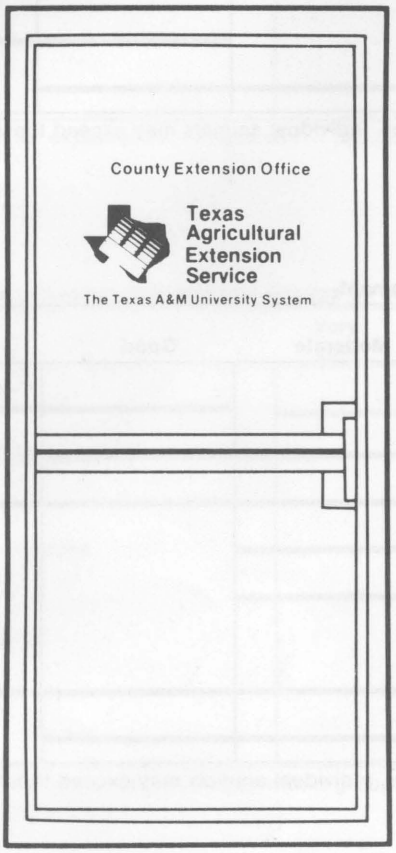

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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Zerle L. Carpenter, Director, Texas Agricultural Extension Service, The Texas A&M University System.
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